

- 1       1) A method of filtering data prior to reading a digital watermark that was inserted  
2       using a scale to black technique, said method comprising the steps of first  
3       projecting the color values of each pixel onto a preferred projection axis that is  
4       determined by examining the color of the surrounding pixels, and by reading the  
5       watermark from the resulting data.
- 6
- 7       2) A system for reading a digital watermark from a digital image which consists of a  
8       number of pixels, each pixel being defined by a set of numbers representing the  
9       color components of the particular pixel, a filter for calculating the value of each  
10      pixel along a preferred projection axis, and a watermark reader which operates  
11      on the values calculated by the filter.
- 12
- 13      3) A method of calculating values that will be used to read a watermark from a  
14      digital image comprising the steps of: projecting the color values of each  
15      particular pixel to a preferred projection axis, said preferred projection axis being  
16      determined by averaging the colors of the pixels in an area surrounding said  
17      particular pixel.
- 18
- 19      4) The method recited in claim 1 wherein the pixels in an area of three by three  
20      pixels is examined to determine the preferred projection axis.
- 21
- 22      5) The method recited in claim 1 wherein said watermark has a particular tile size  
23      and wherein said the pixels in an area the size of said tile are examined to  
24      determine the preferred projection axis.
- 25
- 26      6) The system recited in claim 2 wherein said filter examines the pixels in an area  
27      of three by three pixels to determine the preferred projection axis.
- 28

- 1        7) The system recited in claim 2 wherein said watermark has a particular tile size  
2        and wherein said filter examines the pixels in an area the size of said tile to  
3        determine the preferred projection axis.  
4
- 5        8) The method recited in claim 3 wherein the pixels in an area of three by three  
6        pixels is examined to determine the preferred projection axis.  
7
- 8        9) The method recited in claim 3 wherein said watermark has a particular tile size  
9        and wherein said the pixels in an area the size of said tile are examined to  
10      determine the preferred projection axis.  
11
- 12      10) A system for filtering data prior to reading a watermark by first projecting the  
13      color values of each pixel onto a preferred projection axis that is determined by  
14      examining the color of the surrounding pixels, and by reading the watermark  
15      from the resulting data.  
16
- 17      11) A system for reading a digital watermark in a image that consists of a number of  
18      pixels each represented by a set of numbers representing different colors, said  
19      system comprising,  
20      a filter which projects the set of numbers representing each pixel onto a preferred  
21      projection axis by averaging the values of said pixels of a particular area, and  
22      a watermark reading program for reading said watermark from said preferred  
23      projection axis.  
24
- 25      12) A system for reading a digital watermark from a colored image that consists of  
26      a number of pixels each having multiple color components, said system comprising,  
27      means for filtering said digital image to project the colors components of each pixel  
28      to a preferred projection axis, and  
29      means for reading said watermark from said filtered image  
30

- 1    13) A method of reading a digital watermark from a colored image that consists of  
2    a plurality of pixels and which was watermarked using a scale to black  
3    watermarking technique, said method comprising the steps of  
4    first filtering said colored image to generate filtered data by projecting the color  
5    values of each pixel onto a selected axis that is determined by examining the color  
6    of the surrounding pixels, and  
7    reading the watermark from the resulting filtered data.  
8
- 9    14) A method of reading a digital watermark from a digital colored mage that  
10    consists of a number of pixels, each pixel being defined by a set of numbers  
11    representing the color components of the particular pixel,  
12    filtering the value of the set of numbers that represents each pixel by projecting said  
13    values to a selected axis, the direction of said selected axis being determined by  
14    examining the values of the pixels in an area surrounding said pixel, and reading  
15    said watermark from the values calculated by the filter.  
16
- 17    15) The method recited in claim 14 wherein said filter determines the direction of  
18    said selected axis for each pixel by examining the values of the pixels in a three by  
19    three area surrounding said pixel.  
20
- 21    16) A watermark reading method for reading a watermark that has been inserted  
22    into the luminance value of the pixels of an image by projecting color changes  
23    needed to embed said watermark onto the luminance axis of each pixel by  
24    projecting from an axis from black to the color of the pixel, said method comprising  
25    filtering said image prior to reading said watermark by first projecting the color  
26    values of each pixel onto a preferred projection axis that is determined by  
27    examining the color of the surrounding pixels, and by reading the watermark from  
28    the resulting data.  
29

- 1    17) A method of inserting first and second watermarks in an image comprising,  
2    inserting said first watermarks in said image in a first color direction and inserting  
3    said second watermark in a color direction orthogonal to the color direction of said  
4    first watermark.  
5
- 6    18) A method of reading two orthogonally inserted watermarks from an image by  
7    first filtering said image to project each pixel onto a preferred projection axis  
8    determined by the average color of the surrounding pixels and reading said first  
9    watermark from the resulting data, and then projecting each pixel onto an axis  
10   orthogonal to said preferred projection axis and reading the second watermark from  
11   the resulting data.  
12
- 13   19) The method recited in claim 17 wherein the intensity of said second watermark  
14   is lower than the intensity of said first watermark.  
15
- 16   20) A method of filtering an image containing a digital watermark to generate a set  
17   of values from which said digital watermark can be read, said digital watermark  
18   having been inserted along a particular color axis, said method comprising  
19   projecting the color values of each pixel onto a color axis which approximates the  
20   color axis used to embed said watermark in said pixel.  
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